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Factors associated with adverse events after emergency laparotomy in Cape Town, South Africa: identifying opportunities for quality improvement



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ARTICLE INFO

Article history:

Received 2 April 2016

Received in revised form

23 May 2016

Accepted 4 August 2016

Available online 11 August 2016

Keywords:

Global Surgery

Quality Improvement

Trauma

Gastrointestinal

ABSTRACT

Background: Surgical outcomes research is limited in areas of the world with the greatest unmet surgical need and likely greatest variation in outcomes. Measurement alone may improve outcomes—the so-called Hawthorne effect. The purpose of this multicenter cohort study was to identify factors that are both feasible to collect and are associated with a major adverse event following a targeted procedure in Cape Town, South Africa.

Methods: A collaborative of four acute care surgical units was formed to develop a data set with minimal data burden describing outcomes after an emergency exploratory laparotomy during a 3-mo period (February–April 2015). Controlling for patient, problem, provider, procedure and process predictors, multivariate models were built to identify risk factors for a major adverse event and higher resource use after surgery in our collaborative.

Results: The outcomes of 450 exploratory laparotomies from the four participating hospitals were audited, 319 (70.9%) were for non-trauma and 131 (29.1%) were for trauma. The major adverse event rate was 15.7% (95% CI 12.6–19.4). In the multivariate analysis, factors associated with the primary outcome included age, American Society of Anesthesia score of greater than 2, bowel resection, preoperative CT scan, and a nontherapeutic laparotomy. A major adverse event was associated with all three outcomes assessing increased resource utilization.

Conclusions: This study supports the comparative outcome assessment of a high-volume or high-risk procedure as a proxy for measuring the quality of care provided in a surgical collaborative. Such an exercise can identify opportunities for quality improvement.

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<http://dx.doi.org/10.1016/j.jss.2016.08.025>

Introduction

Measuring the quality of medical care has become extremely important to patients, payers, and providers in the past few decades.¹ The framework defined by Avedis Donabedian to measure quality of medical care involves three concepts—structure, process, and outcomes.² In surgery, outcomes have been the most widely used indicator, as they are the easiest to measure and understand. In addition, measurement alone may improve outcomes—the so-called Hawthorne effect.^{1,3} The main limitation of the use of outcome indicators, however, is the need for risk-adjustment.^{4,5} In other words, the presurgical severity of illness and the procedure performed must be accounted for if outcome indicators are to be used in the comparative assessment of the quality of surgical care.

In the United States, the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) is the most robust risk-adjusted and reliable tool available.⁵ The ACS-NSQIP has been shown to reduce both morbidity and mortality in enrolled hospitals with initially worse performing hospitals having the greatest likelihood of improvement.^{6,7} Following the success of the ACS-NSQIP, the ACS Trauma Quality Improvement Program (ACS-TQIP) was developed. A significant limitation with these programs is they require retrospective collection of over 130 variables. For low-to-middle income countries (LMIC) with limited resources, extrapolating this type of quality measure would be challenging. Research has shown as few as six data variables may be all that is needed for adequate risk-adjustment.⁸ However, indicators that would accurately reflect the quality of care and be the best outcome predictors of these measures in an LMIC are unknown.

Auditing the outcomes of all operations at a hospital is difficult. Choosing one or two operations as proxies for the quality of all surgical care provided has been recently proposed.¹ We chose to study emergency laparotomy (EL), recently declared by the Lancet Commission on Global Surgery to be a, “Bellwether procedure,” or one that all district hospitals should be able to provide safely.⁹ Specifically, we aimed to identify factors that are both feasible to collect and are associated with a major adverse event after EL in Cape Town, South Africa. We hypothesized that a major adverse event was further associated with increased resource utilization.

Material and methods

Study sites

The South African Health System is made of private and government-funded hospitals. The government-funded health system is divided into several health districts each with a central referral hospital. Groote Schuur Hospital (GSH) is the central referral hospital in the Cape Metro West health district and only accepts surgical referrals from three government-funded surgical units within this health district, i.e., two district level hospitals (Mitchell’s Plain District

Hospital and Victoria War Memorial Hospital) and one regional level hospital (New Somerset Hospital). Collectively, these hospitals make up the surgical referral base within the district which serves an estimated catchment area of 2,292,000 uninsured patients.¹⁰

Patient population

Consecutive patients older than 12 y undergoing EL at one of the four hospitals during the study period (1st February 2015–30th April 2015) were included. EL was defined as any abdominal operation requiring open or laparoscopic exploration for emergency (unplanned) indications, trauma, or otherwise.

Method of data capture

REDCap (Research Electronic Data Capture), a free, secure, web-based application was used for its ease to capture real time data.¹¹ A formal introduction to the study was made to all general surgeons and trainees at the participating hospitals and two clinicians per hospital were responsible for the data capture. Data were entered using mobile phones or electronic tablets during ward rounds. Hospital theater registries were reviewed daily at each site to ensure no eligible cases were missed.

Variables for inclusion

After reviewing the variables required in the ACS-NSQIP and TQIP programs, variables used in another study reporting international outcomes after abdominal surgery,¹² and adding contextually relevant variables for South Africa such as HIV status and the highest qualification of attending clinicians, 32 preoperative and intraoperative variables were chosen. These are presented under patient, problem, provider, procedure, and process subheadings in [Table 1](#).

Outcomes

The primary outcome was major postoperative adverse event (AE) defined by the Clavien–Dindo classification system as grade 3 or higher ([Table 2](#)). This included any AE requiring surgical, endoscopic, or radiological intervention or resulting in death.

Secondary outcome used as proxies for resource utilization included:

- Length of stay of greater than 30 d (LOS>30)
- Postoperative Intensive Care Unit (ICU) admission
- Unplanned reoperation.

All AE were recorded daily on ward rounds until discharge. All hospitals in the district reported monthly morbidity and mortality at a combined meeting where the outcome measures were further verified.

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